Subject: -Applied Chemistry (22211)

SYLLABUS

Chapter No.	Name of chapter	Marks
4	WATER TREATMENT AND ANALYSIS	12
5	ELECTROCHEMISTRY AND BATTERIES	11
6	METALS , ALLOYS AND INSULATORS	12
	Total Marks :-	35

CLASS TEST - I
PAPER PATTERN

COURSE:- APPLIED CHEMISTRY (22211)

PROGRAMME: - ELECTRICAL ENGINEERING

Syllabus: -

Unit No.	Name of the Unit	Course Outcome (CO)
1	**WATER TREATMENT AND ANALYSIS**	**211.4**
2	**ELECTROCHEMISTRY AND BATTERIES**	**211.5**

Q.1	**Attempt all MCQ questions.** **First six questions** **6*1= 6 Marks** **(g) & (h) questions** **2*2= 4Marks**	Course Outcome (CO)
a)	Question on first chapter with four options	211.4
b)	Question on first chapter with four options	211.4
c)	Question on first chapter with four options	211.4
d)	Question on second chapter with four options	211.5
e)	Question on second chapter with four options	211.5
f)	Question on second chapter with four options	211.5
g)	Question on first chapter with four options	211.4
h)	Question on second chapter with four options	211.5

COURSE OUTCOME (CO)

COURSE:- APPLIED CHEMISTRY (22211)

PROGRAMME: - ELECTRICAL ENGINEERING

CO.NO	Course Outcome
CO-211.4	Select relevant water treatment process for various applications
CO-211.5	Use relevant electrolyte in batteries for different applications
CO-211.6	Use relevant metals , alloys and insulating materials in various applications

Academic Year 2020-21

04. Water treatment and analysis

Total Marks – 12

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

Water

Water is nature's most wonderful, abundant and useful compound. Without food, human can survive for a number of days, but water is such an essential that without it one cannot survive. Water is not only essential for the lives of animals and plants, but also occupies a unique position in industries. Probably, it's most important use as an engineering material is in the steam generation. Water is also used as coolant in power and chemical plants

Sources of water:

(A) Surface water (B) Underground water

Types of impurities in water:

Natural water is, usually contaminated three types of impurities.

1.Physical impurities.

2. Chemical impurities.

3. Biological impurities

Hardness of water:

The water which does not produce lather with soap is called hard water. Thus, hardness in water is the characteristic, which "prevents the lathering of soap". On the other hand, the water which produce lather easily on shaking with soap solution, is called soft water.

The hardness of water is caused by the presence of dissolved salts such as bicarbonates, sulphates, chlorides and nitrates of divalent metal ions like calcium and magnesium. Soap is sodium or potassium salt of higher fatty acids like stearic, oleic and palmetic acids. When soap is mixed with soft water lather is produced due to stearic acid and sodium stearate.

$$\underset{\text{Sodium Stearate}}{C_{17}H_{35}COONa} + H_2O \longrightarrow \underset{\text{Stearic acid}}{C_{17}H_{35}COOH} + NaOH$$

$$C_{17}H_{35}COONa + C_{17}H_{35}COOH \longrightarrow \text{Lather formation}$$

When soap comes in contact with hard water, sodium stearate will react with dissolved calcium and magnesium salts and produce calcium stearate or magnesium stearate which is white precipitate.

$$\underset{\text{(soluble)}}{C_{17}H_{35}COONa} + \underset{\text{(soluble)}}{Ca^{2+}} \longrightarrow \underset{\text{(insoluble)}}{Ca(C_{17}H_{35}COO)_2} + \underset{\text{(soluble)}}{2Na^{+}}$$

Q.1. The metallic constituents hard water are ……

(a) magnesium, tin and iron
(c) calcium magnesium and iron
(b) iron , tin and calcium
(d) magnesium, calcium and tin

Q.2. Hardness of water is due to the presence of salts of _____

(a) Potassium
(c) Chlorine
(b) Magnesium
(d) Boron

Q.3. Which of the following is NOT a property of hard water ?

(a) It lathers easily with soap solution
(c) It has nice taste
(b) It is not good for steam generation
(d) It causes scale formation in kettles

Hardness	Name of water
0-70 mg/L	**Soft water**
70-150 mg/L	**Moderate hard water**
150-300 mg/L	**Hard water**
>300	**Very hard water**

Types of Hardness:

The hardness of water is two types;

1. Temporary hardness. 2. Permanent hardness.

1. Temporary hardness or Carbonate hardness:

This hardness is caused by two dissolved bicarbonate salts $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$. The hardness is called temporary because, it can be removed easily by boiling. During boiling, bicarbonates are decomposed to yield insoluble carbonates or hydroxides, which are deposited as a crust at the bottom of vessel.

$$Ca(HCO_3)_2 \longrightarrow CaCO_3\downarrow + H_2O + CO_2\uparrow$$

$$Mg(HCO_3)_2 \longrightarrow Mg(OH)_2\downarrow + 2CO_2\uparrow$$

2. Permanent hardness or non-carbonate hardness:

This hardness is due to the dissolved chlorides, sulphates and nitrates of calcium and magnesium. These salts are CaCl2, MgCl2, CaSO4, MgSO4, Ca(NO3)2, Mg(NO3)2. It cannot be removed easily by boiling. Hence, it is called permanent hardness. Only chemical treatment can remove this hardness.

Total Hardness = Temporary hardness + Permanent hardness

Q.4. Hardness of water does not ……

(a) have any bad effect in boiler
(c) make cooking of foods difficult
(b) make it unfit for drinking
(d) cause difficulty washing clothes

Q.5. Temporary hardness of water is caused by the presences of …….

(a) chlorides of Mg and Ca
(c) Chlorine
(b) Magnesium
(d) Boron

Q.6. Which of the following is NOT a property of hard water ?

(a) It lathers easily with soap solution
(c) It has nice taste
(b) It is not good for steam generation
(d) It causes scale formation in kettles

DEGREE OF HARDNESS:

- The Concentration of hardness as well as non-hardness constituting ions are, usually expressed in the term of "Equivalent amount of $CaCo_3$"
- Since this mode permits the multiplication and division concentration, when required. The choice of CaCo3 in particular is due to its molecular weight (m.wt) is "100" (Equivalent wt = 50), and moreover, It is insoluble salt that can be precipitated in water treatment.

Q.7. Permanent hardness is also called as ….....

a) carbonate hardness
c) non-carbonate hardness
b) both (a) and (c)
d) None of these

Q.8. Permanent hardness is the that hardness that cannot be removed by ….....

a) boiling
c) cogulation
b) adding lime
d) all of these

Q.9. Sedimentation is a physical process used to remove ….....

a) colloidal particles
c) microorganisms
b) suspended particles
d) all of these

Q.10. Water which does not produce lather with soap is ….....

a) mineral water
c) soft water
b) hard water
d) distilled water

Q.11. The liquid waste from kitchens, bathrooms and wash basins are not called

a) liquid waste
c) sewage
b) sullage
d) None of these

Q.12. Secondary hardness of water is caused by the presence of ….....

a) microorganisms
c) filtrations

b) chemicals **d) none of these**

Q.13. Which of the following physical method is used as sterilization in modern times for the treatment of potable water?

a) chlorination **c) UV radiation**

b) treating with potassium permanganate d) treating with bleaching powder

Q.14. The standard B.O.D.of water taken for

a) 1 day **c) 5 days**

b) 2 days d) 10 days

Q.15 Fresh sewage may become stable in ….....

a) one hour **c) three to four hours**

b) two to three hours d) six hours

Q.16 Reverse osmosis is a water purification techniques that uses….....

a) congulant **c) semipermable membrane**

b) resins d) lime soda

Q.17. In Ion- exchange process of water softening,exhausted cation exchanger resin is regenerated by using….....

a) dilute acid c) coal

b) alkali d) sand

Q.18. In Ion- exchange process of water softening,exhausted anion exchanger resin is regenerated by using….....

a)alkali c) sand

b) dilute acid d) zeolite

Q.19. When soap is added to hard water, a white precipitate of ….. Is formed.

a) sludge **c) scum**

b) flux d) scales

Q.20. Highly alkaline water in boiler causes ….....

a) corrosion c) priming and foaming

b) scale and sludge formation **d) caustic embrittlement**

Q.21. When soft,loose,silmy deposits are formed inside the boiler and do not stick up permanently then they are known as ….....

a) resins c) scales

b) zeolite **d) sludge**

Q.22. ….. Is not the consequence of scale and sludge formation in the boiler.

a) Abrasion c) Dangerous of explosion

b) Wastage of fuel d) Decreases in efficiency

Q.23. For domestic use,water must be ….....

a) sparkling **c) hygenically pure**

b) free from salts d) free from chlorides

Q.24. Screening is the process of removing …..... From water.
a) scales and sludge
b) floating materials
c) suspended particles
d) hardness

Q.25. Coagulation process removes…….....
a) floating materials
b) suspended particles
c) colloidal particles
d) micrporganisms

Q.26. Colloidal particles are responsible for …….....
a) hardness of water
b) turbidity of water
c) odour of water
d) all of these

Q.27. Coagulant like alum is added to water to remove …….....
a) biological impurities
b) floating materials
c) colloidal impurities
d) all of these

Q.28. Sterilization of water can be done by …….....
a) chlorination
b) aeration
c) using UV rays
d) all of these

Q.29. In chlorination process,germs are killed by …….....
a) chlorine gas
b) chloramin
c) bleaching powder
d) all of these

Q.30. The principle of chlorination is …….....
a) formation of nascent oxygen
b) formation of oxygen molecules
c) formation of chlorine gas
d) formation of hydrochloric acid

Q.31. In ozonisation,……..... Is used to sterilze water.
a) oxygen gas
b) ozone gas
c) solid ozone
d) chlorine gas

Q.32. Aeration is a process of …….....
a) spraying water into fine droplets
b) allowing water to flow in ditch
c) storing water in a tank
d) all of these

Q.33. Swimming pool water should be sterilized by …….....
a) sedimentation
b) chlorination
c) aeration
d) UV rays

Q.34. Ozone acts as …….....
a) sterilizing agent
b) decolorising agent
c) deodourising agent
d) all of these

Q.35. Zeolite softening process removes …….....
a) only temporary hardness of water
b) only permanent hardness of wate
c) both temporary and permanent hardness of water

d) dissolved gases in permanent hard water

Q.36. Reverse osmosis is a water purification techniques that uses…....

a) coagulant
c) semipermeable membrane
b) resins
d) lime soda

05. Electrochemistry and Batteries

Total Marks – 11

MCQ Question

(Total number of Question=Marks*3=11*3=33)

Note: Correct answer is marked with **bold.**

Q.1. Sodium Chloride is a ….....
a) metallic conductor
b) electrolytic conductor
c) both (a) and (b)
d) None of these

Q.2. Which of the following is an electrolyte ?
a) benzene
b) chloroform
c) alcohol
d) sodium chloride

Q.3. Which of the following does not conduct electricity ?
a) molten NaCl
b) NaCl crystals
c) solution of NaCl in water
d) None of these

Q.4. Acetic acid is a weak electrolyte because ….....
a) its molecular weight is high
b) it is a covalent compound
c) it does not dissociate much
d) it is highly unstable

Q.5. Sulphuric acid is stronger acid than acetic acid because
a) it dissociates completely
b) it has high molecular weight
c) acetic acid does not ionise
d) Acetic acid is strongly ionised

Q.6. Pure water does not conduct electricity because it is ….....
a) neutral
b) has low boiling point
c) almost not ionised
d) decomposed easily

Q.7. Specific Conductance is the conductance of solution of volume ….....
a) 1 cm^3
b) 10 cm^3
c)100 cm^3
d) 1000 cm^3

Q.8. The unit of specific conductance is ….....
a) ohm cm^{-1}
b) ohm^{-1} cm
c) ohm cm
d) $ohm^{-1}cm^{-1}$

Q.9. The electrode potential is the tendency of metal ….....
a) to gain electrons
b) to lose electrons
c) either to lose or gain electrons
d) None of these

Q.10. Calomel Electrode is constructed using a …..... Solution.

a) saturated KCl c) saturated NH4Cl

b) saturated CaCl2 d) saturated NaCl

Q.11. A Galvanic cell converts ….....

a) electrical energy into chemical energy c) electrical energy into heat energy

b) chemical energy into electrical energy d)chemical energy into heat energy

Q.12. Equivalent conductance of a weak electrolyte on dilution ….....

a) decreases **c) increases**

b) remail unchanged d) first increases and then decreases

Q.13. During charging of a lead-acid cell ….....

a) its voltage increases c) its cathode become dark brown in colour

b) fit gives out energy d) specific gravity of H2SO4 decreases

Q.14. During charging the specific gravity of electrolyte of a lead acid battery ….....

a) increases c) remain the same

b) decreases d) becomes zero

Q.15. Cells are connected in series in order to ….....

a) increases the voltage rating c) increases the life of the cell

b) increases the current rating d) for decent appearance

Q.16. In a lead-acid cell,lead is called as ….....

a) positive active material c) passive material

b) negative active material d) None of these

Q.17. The lead acid cell should never be discharged beyond ….....

a) 1.8 V c) 2 V

b) 1.9 V d) 2.1 V

Q.18. Dry cell is a modification of ….....

a) Daniel Cell c) lead-acid cell

b) Leclanche cell d) Edison Cell

Q.19. In alkaline battery , the electrolyte is ….....

a) dilute H2SO4 acid c) NaOH

b) concentrated H2SO4 acid **d) KOH**

Q.20. One ampere hour charge is equivalent to ….....

a) 36 coulombs **c) 3600 coulombs**

b) 360 coulombs d) 36000 coulombs

Q.21. …..... reference electrodes is used with glass electrode in measuring pH.

a) hydrogen c) copper

b) calomel d) none of these

Q.22. Which batteries are rechargeable?

a) primary
b) secondary
c) solar cells
d) none of these

Q.23. Which battery is used in aeroplanes ?
a) dry cell battery
b) lead acid battery
c) nickel- cadmium battery
d) none of these

Q.24. Containers of lead acid battery are ….....
a) moulded hard water
b) ceramics
c) formation of chlorine gas
d) formation of hydrochloric acid

Q.25. In ozonisation,…..... Is used to sterilze water.
a) oxygen gas
b) ozone gas
c) celluloid
d) any of these

Q.26. The life of lead acid battery is expected to be ….....
a) 6 months
b) 1 year
c) 2 - 5 years
d) 10 - 15 years

Q.27. The negative pole of a dry cell is made of ….....
a) carbon
b) copper
c) zinc
d) mercury

Q.28. Ozone acts as ….....
a) sterilizing agent
b) decolorising agent
c) deodourising agent
d) all of these

Q.29. When a lead acid battery is in fully charged condition, the colour of its + ve plate is …...
a) dark gray
b) brown
c) dark brown
d) blue

Q.30. The capacity of a battery can be revived by ….....
a) adding distilled water
b) adding so-called battery restorer
c) a dose of H2SO4
d) none of these

Q.31. It is noted that during charging of a lead accumulator
a) voltage increases
b) energy is absorbed
c) specific gravity of H2SO4 increases
d) all of these

Q.32. When the lead acid cell is fully charged, the electrolyte assumes ….....appearance.
a) dull
b) reddish
c) bright
d) milky

Q.33. Unit of cell constant is ….....
a) cm^-1
b) cm
c) cm2
d) none of these

06. Metals, Alloys and Insulators

Total Marks – 12

MCQ Question

(Total number of Question=Marks*3=12*3=36)

Note: Correct answer is marked with **bold.**

Q.1. The most rugged temperature sensing element listed here is ….....
a) thermocouple c) glass electrode
b) iron metal d) all of these

Q.2. Type K thermocouple is made of the following metals ….....
a) iron and constantan **c) copper and constantan**
b) chromel and alumel d) aluminium and tungsten

Q.3. Which thermocouple can be used to measure a temperature of around 1400 C ?
a) copper-constantan **c) platinum-platinum + rhodium**
b) aluminium-chromel d) None of these

Q.4. Thermocouple is suitable for measuring ….....
a) liquid temperature only c) very low temperature only
b) very high temperature only **d) both high and low temperature**

Q.5. Chromel - constantan make …..... Type of thermocouple.
a) K c) J
b) E d) R

Q.6. Constantan is also named as ….....
a) advance c) eureka
b) ferry **d) all of these**

Q.7. In conductors, electrons can flow because their ….....
a) ions are free **c) electrons are free and mobile**
b) protons are free d) negative ions are free

Q.8. Nichrome wire is an alloy of ….....
a) lead and zinc **c) nickel-chromium**
b) chromium and vanadium d) copper and silver

Q.9. Glass is a ….....
a) transparent solid c) coloured solid

b) transparent supercooled liquid d) None of these

Q.10. Which tree give out latex to obtain natural rubber?
a) eucalyptus c) anogesissus
b) heavea brasillensis d) astragaius

Q.11. Which substance is added to the dilute latex to coagulate rubber?
a) acetic acid c) oil
b) sodium salt d) water

Q.12. Which of the following is a monomer in natural rubber?
a) vinyl chloride **c) isoprene**
b) ethylene chloride d) chlorine

Q.13. What kind of synthetic rubbers are commonly known as thikols?
a) polyurethane rubbers c) fluorocarbons rubbers
b) polysulphides rubbers d) polyacrylic rubbers

Q.14. Which is not a polymer?
a) plastic c) teflon
b) rubber **d) water**

Q.15. Buna-S is obtained from ….....
a) butadiene + styrene c) urea + formaldehyde
b) adipic acid + hexadiamine d) chloroprene

Q.16. Vulcanization is the process of heating crude rubber with ….....
a) sodium c) carbon
b) phosphorus **d) sulphur**

Q.17. Carbon atoms makes …..... types of bond with other carbon atom.
a) covalent c) metallic
b) ionic d) hydrogen

Q.18. Buna - S is a .....
a) thiokol **c) styrene rubber**
b) neoprene d) butyl rubber

Q.19. In the structure of fullerene, each carbon atom forms covalent bond with ….. Other carbon atoms .
a) one **c) three**
b) two d) four

Q.20. The compressive strength of nanotube …..... Its tensile strength?
a) is less then c) is equal
b) is greater than d) may be greater than

Q.21. In a molecule of graphene, atom of carbon are bonded into …….....
a) spherical structure **c) honeycomb structure**
b) tube structure d) all of these

Q.22. ….. is a potential nanomaterial for future applications in various fields.
a) fullerene
c) graphene
b) silicon
d) copper

Q.23. Most graphene patents have been taken in the world by ….....
a) Samsung
c) IBM
b) ocean's king lighting
d) Nokia

Q.24. The ability of a metal to take exact dimension of the mould is …..
a) tensile strength
c) stiffiness
b) casting
d) refractoriness

Q.25. The property of a metal by which they can be beaten into thin sheets is called …....
a) malleability
c) expansion
b) ductility
d) stiffiness

Q.26. Which of the following is a good conductor of electricity ?
a) iron
c) wood
b) plastic
d) glass

Q.27. Which metal found in liquid state at room temperature ?
a) Fe
c) Hg
b) Zn
d) Al

Q.28. …..... describe the way a substance reflects light or shines.
a) magnetism
c) luster
b) brittleness
d) ductility

Q.29. It a metal breaks easily , it is said to be …..
a) magnetic
c) brittle
b) conductive
d) luster

Q.30. Which of the following is the best electrical conductor ?
a) copper
c) platinum
b) aluminium
d) nickel

Q.31. Which of the following describe metals ?
a) malleable and ductility
c) dull and brittle
b) solid, liquid and gases at room temperature
d) semiconductors

Q.32. Fullerene is prepared by …....
a) exfoliating graphite
c) by dissolving graphite
b) by evaporating graphite
d) by grinding graphite

Q.33. Graphene is prepared by …....
a) exfoliating graphite
c) by dissolving graphite
b) by evaporating graphite
d) by grinding graphite

Q.34. ….. is a building unit of graphite.

a) silicon
c) graphene
b) carbon
d) fullerene

Q.35. Unit operation of a unit process may be ….....

a) physical method
c) both (a) and (b)
b) chemical method
d) none of these

Q.36. Mass balance is a ….....

a) quantity
c) process
b) energy
d) property